



Advanced Cooling Solutions for Energy Storage System Applications

How Concentric can support you in your
energy storage system cooling needs

Concentric at a glance | 100+ years of know-how with a global footprint & proven solutions for energy storage solutions



Concentric highlights

~400€ M Revenue (FY24)

15 Sites globally

200K+ Pumps running today in ESS

300K+ Fans sold to date

100+ Years of experience

Our advanced technology offering



E-Water Pumps



E-Oil Pumps



Fans



Thermal Management Systems



Water Pump Clutch System



EHS

We can serve a broad range of ESS cooling technologies...

ESS thermal mgmt. technology



Passive air cooling



Forced air cooling



Direct liquid cooling



Indirect liquid cooling



Immersion cooling

How Concentric supports the thermal mgmt. technology

Not applicable

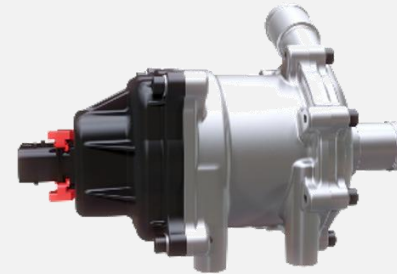
Co-development of electric fans for HVAC systems, rack airflow, and/or PCS air-cooling

Modular pump and customized specs also available; electric fans to complement liquid-cooled radiators

Customized pump systems integrated with liquid-to-air or liquid-to-liquid heat exchangers

Bespoke dielectric-compatible pumps co-developed to customer specs, both for 1- and 2-phase cooling

... and offer customizable DC pumps & fans for all applications



Select specifications

- Brushless DC, sensorless
- Integrated controller
- Nominal low voltage: 12-48V DC
- Nominal high voltage: 500-850V DC
- Ambient temp: -40 to 95 °C
- Software control configurable

**See appendix for detailed pump & fan specs, as well as current solutions running with customers*

What makes Concentric pumps & fans unique

**50k+ hours
lifetime**

... of our pumps & fans that is battle-proven and best-in-class reliability

**UL certification
ready**

... with material compatibility of wetted parts per guidelines

**Ultra-efficient
pump & fan**

... that meets required flow/power density while minimizing energy draw

Cross-sector track-record | We are working with global market leaders across industries, including energy storage systems

Non-exhaustive overview

Global industrial & power-train leaders



Heavy equipment & vehicle OEMs



ESS & DC players



Confidential
(Global provider of infrastructure to DCs)

Confidential
(Global provider of liquid cooling solutions to DCs)

Confidential
(Global leading manufacturer of utility-scale battery)

We have a collaborative working style & can adapt to your needs

Typical collaboration style with our customers



Agile design sprints with weekly design-reviews & short test cycles to enable fast time-to-market



Off-the-shelf-to-co-engineered bandwidth – from catalogue pumps/fans to fully joint-designed modules



Production-ready hand-over with UL support and pilot-run supervision for smooth ramp-up



We propose to set up a joint meeting to showcase our offering and discuss specific requirements



Please do not hesitate to reach out to us!



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ESS pump offering | We offer several pumps for ESS applications with customizations available

	 CAB200	 WP120	 CAB600	 WP150	 WP150 HV	 CAB 2kW	 CAB 4kW
High / Low voltage	Low voltage	Low voltage	Low voltage	Low voltage	High voltage	High voltage	High voltage
Rated Performance	50 LPM @ 1.75 Bar	100 LPM @ 1.75 Bar	100 LPM @ 2.5 Bar	250 LPM @ 1.75 Bar	300 LPM @ 2.25 Bar	250 LPM @ 2.25 Bar	500 LPM @ 2.75 Bar
Voltage Capability	24 VDC Only	12 & 24 VDC	24 & 48* VDC	12 & 24 VDC	450-850 VDC	450-850 VDC	450-850 VDC
Pump Type	Centrifugal, Seal-less	Centrifugal, Sealed	Centrifugal, Seal-less	Centrifugal, Sealed	Centrifugal, Sealed	Centrifugal, Seal-less	Centrifugal, Seal-less
Package Size	205 x 115 x 135.5 (mm)	190 x 180 x 130 (mm)	165 x 210 x 175 (mm)	205 X 190 x 190 (mm)	235 x 235 x 185 (mm)	205 x 240 x 180 (mm)	215 x 260 x 210 (mm)
Weight	1.75 kg	2.8 kg	3.2 kg	7 kg	7.5 kg	5.5 kg	8.3 kg
Safety Level	QM	QM	QM	QM	QM	QM	QM
EMC	CISPR 25 Class 5	ECE Reg 10	CISPR 25 Class 5	ECE Reg 10	CISPR 25 Class 3	CISPR 25 Class 5	CISPR 25 Class 5

*Flow curves available upon request

ESS fan offering | We also offer fans for ESS thermal management, to support your air cooling needs

	 F11	 F15	 F15 HV	 F31 HV
High / Low voltage	Low voltage	Low voltage	High voltage	High voltage
Rated Performance	1500 CFM @ 1.5" H2O	3000 CFM @ 1.5" H2O	3500 CFM @ 2.0" H2O	19000 CFM @ 4" H2O
Voltage Capability	12 & 24 VDC	12 & 24 VDC	800 VDC	800 VDC
Fan Type	Axial	Axial	Axial	Axial
Package Size	Ø350 x 115 (mm)	Ø445 x 131 (mm)	Ø445 x 165 (mm)	Ø930 x 315 (mm)
Weight	3.9 kg	8.2 kg	8.6 kg	45 kg
Safety Level	QM	QM	QM	QM
EMC	ECE Reg 10	ECE Reg 10	ECE Reg 10	ECE Reg 10

*Performance curves available upon request

Solutions in the field | We are already supporting multiple ESS customers in the field, both in PCS and battery cooling

Deployed PCS cooling solution



PCS electric fans

Fan type	F15 fans
Customization	Custom connectors
Certifications	E-Mark/UL/CSA

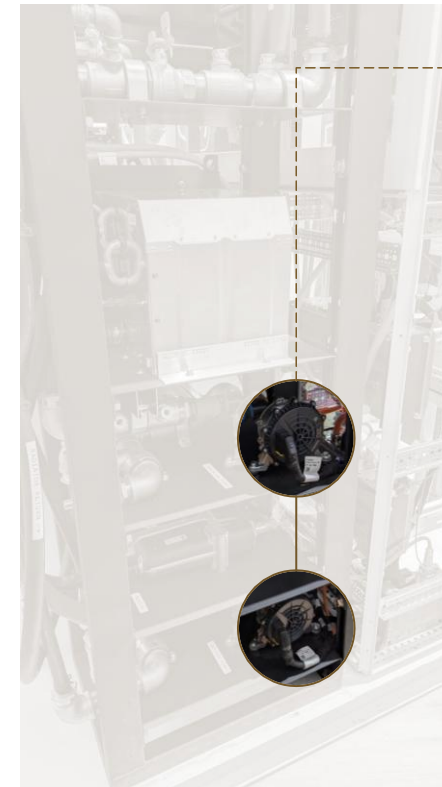
Current & temp limit, locked rotor, and over/under voltage protection

PCS water pumps

Pump type	WP120 water
Customization	No customizations

Transients, short circuit, and reverse battery protection

Deployed battery cooling solution



Battery water pumps

Pump type	CAB600
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Customization No customizations

Each pump supports one side of the AC-based liquid cooling loop: one circulates coolant through the radiator (hot side / condenser circuit), and the other circulates coolant through the battery modules (cold side / evaporator circuit)



**We look forward to
working with you!**